

CLAIMS

1. (Previously Presented) A glass-melting furnace comprising:
an elongated channel consisting of a charge end wall, a discharge end wall, two side walls, a floor, and a roof, the elongated channel defining an upstream melting end, a downstream fining end through which molten glass is discharged, the upstream end being positioned upstream of the downstream end in the glass-melting furnace;
a charger supplying glass-forming material to the upstream end of the glass-melting furnace;
at least one burner supplying at least a majority of the heat to the glass-forming material at the upstream end of the glass-melting furnace;
the upstream end and the downstream end being configured to allow unimpeded flowing and blending of the glass-forming material; and
an exhaust disposed within the downstream end of the glass-melting furnace for exhausting combustion gases only from the downstream end of the glass-melting furnace, the exhaust further being positioned downstream of the at least one burner;
the exhaust disposed for allowing exhaust gases to provide additional heat to the melting glass-forming material, and for allowing at least some air-entrained glass-forming materials to settle back into the melting glass as exhaust gases travel from the upstream end to the downstream end.

2. (Previously presented) The glass-melting furnace of claim 1 in which the at least one burner is mounted through the roof of the glass-melting furnace.

3. (Original) The glass-melting furnace of claim 1 in which the at least one burner is a plurality of burners.

4. (Original) The glass-melting furnace of claim 3 in which more than 50 percent of the burners are positioned upstream of the exhaust.

5. (Original) The glass-melting furnace of claim 4 in which all of the burners are positioned upstream of the exhaust.
6. (Original) The glass-melting furnace of claim 1 in which the exhaust is an exhaust stack.
7. (Original) The glass-melting furnace of claim 1 in which the exhaust is a plurality of exhaust stacks.
8. (Previously presented) The glass-melting furnace of claim 1 in which the exhaust is disposed at a discharge end wall of the glass-melting furnace.
9. (Previously presented) The glass-melting furnace of claim 1 in which the exhaust is disposed at a sidewall of the glass-melting furnace.
10. (Previously presented) The glass-melting furnace of claim 1 in which the at least one burner is a plurality of burners mounted through the roof of the glass-melting furnace, all of the burners are positioned upstream of the exhaust outlets, and the exhaust comprises at least two exhaust outlets.
11. (Original) The glass-melting furnace of claim 10 in which the exhaust outlets are a plurality of exhaust stacks.
12. (Previously Presented) A glass-melting furnace comprising:
an elongated channel consisting of a charge end wall, a discharge end wall, two side walls, a floor, and a roof, the elongated channel defining an upstream melting end and a downstream fining end through which molten glass is discharged, the upstream end being positioned upstream of the downstream end in the glass-melting furnace;

the upstream end and the downstream end being configured to allow unimpeded flowing and blending of melting glass-forming material;

an exhaust disposed within with the glass-melting furnace, the exhaust having a centerline that is positioned at least about 70 percent of the distance from the charge end wall of the glass-melting furnace to the discharge end wall of the glass-melting furnace for exhausting combustion gases in the glass-melting furnace;

the exhaust disposed for allowing exhaust gases to provide additional heat to the melting glass-forming material, and for allowing at least some air-entrained glass-forming materials to settle back into the melting glass as exhaust gases travel from the upstream end to the downstream end.

13. (Previously presented) The glass-melting furnace of claim 11 in which the exhaust centerline is positioned at least about 80 percent of the distance from the charge end wall of the glass-melting furnace to the discharge end wall of the glass-melting furnace.

14. (Previously presented) The glass-melting furnace of claim 12 wherein the glass-melting furnace comprises two sidewalls and two exhausts, each exhaust being separated laterally from the sidewalls.

15. (Previously Presented) In a glass-melting furnace having an elongated channel consisting of a charge end wall, a discharge end wall, two side walls, a floor, and a roof, the elongated channel defining an upstream melting end and a downstream fining end through which molted glass is discharged, the upstream end being positioned upstream of the downstream end, the improvement comprising:

the upstream melting end and the downstream fining end being configured to allow unimpeded flowing and blending of melting glass-forming material;

an exhaust disposed within the glass-melting furnace at the downstream end of the glass-melting furnace for exhausting combustion gases in the glass-melting furnace only from the downstream end;

the exhaust disposed for allowing exhaust gases to provide additional heat to the melting glass-forming material, and for allowing at least some air-entrained glass-forming materials to settle back into the melting glass as exhaust gases travel from the upstream end to the downstream end.

16. (Original) The glass-melting furnace of claim 15 wherein the exhaust is disposed at the discharge end wall.

17. (Original) The glass-melting furnace of claim 15 wherein the exhaust comprises an exhaust stack.

18. (Original) The glass-melting furnace of claim 15 wherein the exhaust comprises a plurality of exhaust stacks.

19.-26. (Cancelled)

27. (Previously Presented) A glass-melting furnace comprising:
an elongated channel consisting of a charge end wall, a discharge end wall, two side walls, a floor, and a roof, the elongated channel defining an upstream melting end and a downstream fining end through which molten glass is discharged;

a charger supplying glass-forming material to the upstream end of the glass-melting furnace;

the upstream end and the downstream end being configured to allow unimpeded flowing and blending of melting glass-forming material; and

at least one exhaust at the downstream end of the glass-melting furnace for exhausting combustion gases only from the at least one exhaust;

the exhaust being disposed to i) allow exhaust gases to provide additional heat to the melting glass-forming material, and ii) allow at least some air-entrained glass-forming materials to settle back into the melting glass as exhaust gases travel from the upstream end to the downstream end.

28. (Previously presented) The glass-melting furnace of claim 27 in which the at least one exhaust has a centerline that is positioned at least about 70 percent of the distance from the upstream end to the downstream end of the glass-melting furnace.

29. (Previously Presented) A glass-melting furnace comprising:
an elongated channel consisting of a charge end wall, a discharge end wall, two side walls, a floor, and a roof, the elongated channel defining an upstream melting end and a downstream fining end through which molten glass is discharged;
a charger supplying glass-forming material to the upstream end of the glass-melting furnace;
the upstream end and the downstream end being configured to allow unimpeded flowing and blending of melting glass-forming material;
at least one burner supplying heat to the glass-forming material at the upstream end of the glass-melting furnace; and
one or more exhausts disposed only at the downstream end of the glass-melting furnace for exhausting combustion gases in the furnace only from the downstream end of the glass-melting furnace;
the exhaust disposed for allowing: i) exhaust gases to provide additional heat to the melting glass-forming material, and ii) at least some air-entrained glass-forming materials to settle back into the melting glass as exhaust gases travel from the upstream end to the downstream end.

30. (Previously presented) The glass-melting furnace of claim 29 in which the one or more exhausts have centerlines that are positioned at least about 70 percent of the distance from the upstream end to the downstream end of the glass-melting furnace.

31. (Previously Presented) A glass-melting furnace comprising:
an elongated channel consisting of a charge end wall, a discharge end wall, two side walls, a floor, and a roof, the elongated channel defining a melting zone first half, and a fining zone second half through which molten glass is discharged;
a charger supplying glass-forming material to a charge end of the first half of the glass-melting furnace;
the upstream end and the downstream end being configured to allow unimpeded flowing and blending of melting glass-forming material;
at least one burner supplying heat to the glass-forming material in the first half of the glass-melting furnace; and
at least one exhaust disposed within the second half of the glass-melting furnace and no exhaust disposed within the first half of the glass-melting furnace for exhausting combustion gases only from the second half of the glass-melting furnace;
the exhaust disposed for allowing: i) exhaust gases to provide additional heat to the melting glass-forming material, and ii) at least some air-entrained glass-forming materials to settle back into the melting glass as exhaust gases travel from the upstream end to the downstream end.

32. (Previously presented) The glass-melting furnace of claim 31 wherein the first half defines a charge end and the second half defines a discharge end, the at least one exhaust having a centerline that is positioned at least about 70 percent of the distance from the upstream end to the downstream end of the glass-melting furnace.

33. (Cancelled)

34. (Previously Presented) The glass-melting furnace of claim 1 further at least one downstream burner supplying heat to the downstream fining end.

35. (Previously Presented) The glass-melting furnace of claim 34 in which the downstream burner is mounted in the roof.

36. (Previously Presented) The glass-melting furnace of claim 35 in which at least one upstream burner is mounted at an angle of up to about 20 degrees to the vertical.

37. (Previously Presented) The glass-melting furnace of claim 36 in which the downstream burner is mounted at an angle of up to about 20 degrees to the vertical.